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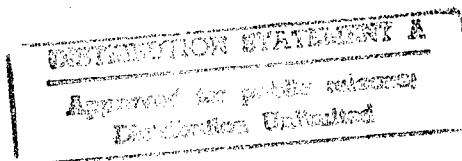
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MAIN FILE

SHIPBUILDING AND DESIGNING WORK
IN COMMUNIST CHINA

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SHIPBUILDING AND DESIGNING WORK
IN COMMUNIST CHINA

[The following are translations of selected articles from
Chung-kuo Tsao-ch'uan (Chinese Shipbuilding), Shanghai,
No 4, 15 October 1959.]

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SCIENTIFIC AND TECHNICAL DEVELOPMENT IN THE PAST TEN
YEARS AS SEEN FROM TWO PRODUCT DESIGN INVESTIGATION
CONFERENCES

/This is a translation of an article written by Huang K'un appearing in Chung-kuo Tsao-ch'uan (Chinese Shipbuilding), No.4, 15 Oct. 1959, pages 1-4./

(1)

I have recently taken part in two investigation conferences on marine designing and have come away from these conferences with increased knowledge. Through these investigation conferences, we may see the rapid development of our shipbuilding science and technology over the past ten years.

Ships are means of communication and transportation. They are also the means for searching for the treasure of the seas, for carrying out marine studies and for dredging. They are also instruments of national defence. When the campaign for the great leap forward began in 1958, communications and transportation were given priority. Ships were, of course, included.

Boats were used in China several thousand years ago. According to the Mirror of History (T'ung Chien), the Yellow Emperor ordered Kung-ku and Hua-hu to build boats by hollowing out trees and to make oars of wood so that impassable streams could be crossed. Throughout the ages, working people engaged in shipbuilding have made many important contributions. The Book of Change has the following to say about boats: "It is the hollowness of a boat that enables it to cross large rivers. The hollowness of a boat prevents it from sinking" (hollowness" refers to displacement). These quotations show that the principle of buoyancy in relation to boats was understood as early as the Chou Dynasty.

In the book Hsi-ming (Explaining Terms) written by Liu Hsi in the later Han Dynasty, such terms as "sail", "oar" and "rudder" were explained. Arabs who came to China early in the T'ang Dynasty transmitted the technique of shipbuilding to the Mediterranean. From poems written by Chang Chi and Li Po during the T'ang Dynasty, we can see that boats were the principal means of communication during Sui

and T'ang times. And, there was an important battle between the Three Kingdoms in which war vessels were destroyed by fire. During the Ming Dynasty, the eunuch Cheng Ho led a Chinese fleet to the South Seas, and Cheng Ch'eng-kung /Koxinga/ attacked Taiwan with his naval forces. These facts show that ships were used in warfare early in Chinese history.

The long history of the use of wooden ships in China and the precious experience obtained in the building of ships are important to the development of the modern science and technique of shipbuilding. Our science and technique of shipbuilding should have been quite advanced. However, progress along these lines was blocked by the ruling classes of the past, such as the reactionary ones of the Ming and Ch'ing dynasties who forbade fishing boats and merchant ships from going to sea.

During the era of the Kuomintang, whose leaders were running dogs of the imperialists, the feudal elements, the war lords and bureaucratic capitalists, the country and people were reduced to abject poverty. Not only were there no institutions for the study of the science and technique of shipbuilding and designing, but even the building of wooden ships was in a backward state, which was typical of the whole handicraft industry. Although shipyards were in existence in Shanghai quite early, they were only capable of doing repair work during that era.

In 1900, the Sea and Rivers /Hai-ho/ Bureau was established in Tientsin and around 1913, dredging companies were formed in Shanghai. Some of the enterprises were the result of direct aggression on the part of the imperialists. Others /owned by Chinese/ bought a few ships (dredgers, etc.) from the imperialists through the reactionary regime. Their purpose was to exploit the Chinese people, and commit aggression in China so as to enrich themselves. None of these activities can be said to have contributed to the development of the science and technique of shipbuilding.

China possesses a huge territory and rich resources. Her people are hard-working and courageous. She has a coast line of over 10,000 kilometers, and she possesses such valuable islands as Taiwan, the Pescadores, etc. And, in a territory of almost 10 million square kilometers are numerous rivers and lakes. All these should be utilized for socialist enterprise, strengthening national defense and improving the people's livelihood. Thus the development of the science and technology of shipbuilding is of great importance to modern

communications and transportation, a modern fishing industry and an up to-date system of national defense. Since the liberation, the science and technology of shipbuilding has been rapidly established and developed under the correct leadership of the Party and the policy of promoting production and national defense.

The science and technology of shipbuilding are comprehensive studies. From the point of view of science, it includes such studies as fluid and structural mechanics, mechanical dynamics, materials, technology, and high and low voltage electricity, etc. There are also many departments as far as technology is concerned. The building of almost any ship requires scientific study. Designing (draft designing, technical designing and construction designing) begins only after the necessary calculations have been made. Not only are these processes necessary in building the body of the ship, they are also necessary in installing the engine, electrical and other special equipment.

From the point of industrial production, the technique is also a comprehensive one. There are many types of ships, such as coastal passenger and freight vessels (or ships for freight only), ocean liners and river ships. This is to classify them according to their navigation routes. Classified according to their function, there are passenger and freight ships, dredgers, light ships and survey ships. Among the products examined at one of the ship design investigation conferences was a ship that was designed to carry out marine studies. This type of ship requires a high degree of navigability and stability. Other ships may return to the harbor in times of storm, but these must venture out to sea to engage in scientific studies during stormy weather.

At another investigation conference, a number of service vessels such as ships to dig and raise rocks, crush rocks, to do drilling, to set off explosives, to generate electricity, and to raise heavy loads, etc., were being investigated. Such ships must meet many requirements. For instance, ships used to dig and crush rock must work on granite in water depths up to 17 meters, with water flowing at a speed of 3 meters per second. Such ships must, of course, undergo a series of scientific studies and tests. The common difficulty is that there are at present no past data or reference material to go on. This requires us to undertake creative scientific and designing work.

Not only must we overcome technical difficulties, we must

also make economic comparisons. The engineering and technical personnel must follow the guidance of the Party and the policy indicated by the General Line of the Party to build socialism by exerting our utmost efforts and by pressing ahead consistently so as to achieve greater faster, better and more economical results. They must eliminate superstitions and liberate their thought. In addition, they must learn from both Chinese and foreign experts and hold discussions with the personnel who man service vessels. And, they must study and make experiments on concrete problems, and make the necessary calculations so as to obtain the data required for drafting and designing. After undergoing discussion and investigation by the experts and the engineering and technical personnel at the conference, some types of ships have passed the designing stage and entered the production stage. Others, after having gone through further testing and examination by the departments concerned, may also enter the stage of technical designing.

(2)

Through the investigation conference, we saw the rapid rise of the scientific and technical level which shipbuilding has undergone over the past ten years in our country, and the rapid growth, new strength and the new features achieved by our scientific and technical personnel.

The new scientific and technical level of shipbuilding achieved in the past ten years had no precedent in the history of old China. Such progress is even difficult for the scientific and technical personnel of the capitalist countries to imagine. Before the liberation, China hardly had her own scientific and technical set-up for shipbuilding. Some companies (the Min-sheng Company, for instance) had shipyards which were able to do a little designing. They felt that China should be able to do its own ship designing and building. Before the liberation, the veteran shipbuilders (16 persons) of the Min-sheng Company concentrated all their efforts for two years on designing a single ship. The result was a 2000-horsepower trawler for the Yangtze River. The ship was not actually built until after the liberation. The designing of a 3000-horsepower freighter was completed only after the designs were sent to the United States for examination.

Under the reactionary Kuomintang regime, the ships that were designed by ourselves were small in size and few in

number. Engineering and technical personnel engaged in the study and design of ship engines were also few. A senior engineer who taught in a school over 30 years ago told his students that China should be able to design ship engines and that even building a diesel engine of 100 or 200 horsepower would be a good thing.

Whatever hope the teacher may have had in his students, they did not have the chance to fulfill it for they would either lose their jobs and change their profession or join foreign firms to engage in business. Foreign firms were the means through which the imperialists sold their goods in China. Their object was to kill the Chinese machine industry. This was the fate of scientific and technical work in China and of the scientific and technical workers under the reactionary regime.

In the ten years since the liberation, the science and technology of shipbuilding, like all other enterprises, has made great advances. Under the leadership of the Party and the guidance of the General Line, not only have we organized special agencies for studying and designing ships, but our scientific and technical level and our experience have been rapidly improved through practical work. We are not only designing 5,000, 8,000 and 10,000 ton coastal passenger ships and freighters and mechanizing and modernizing fishing boats, but we are also designing 10,000 ton and 18,000 ton ocean-going ships. We are also doing research in water "van" passenger ships and service ships that have been recently introduced.

With regard to ship engines, designs have been completed for 2,000 horsepower diesel engines and trial manufacturing of 8,800 horsepower diesel engines is being carried out. Moreover, various Chinese models of ship engines (both main and auxiliary units) will be produced. We have also completed research and designing of a 17,000 horsepower hydraulic power computing machine. In the fields of electricity, special instruments, shipbuilding materials and technology new products have been introduced. A few of our scientific and technical achievement have reached international standards. For example light and electric remote control cutting machines used in shipbuilding have achieved that level. These facts testify eloquently to the rapid improvement of our scientific and technical level in the past ten years.

While the scientific and technical levels were being

rapidly raised, the number of personnel to handle these tasks has also been rapidly increased, thus bringing into being a new force. After the liberation of Shanghai, the Party organized a small number of technical personnel who set up a preparatory bureau and a designing bureau. We now have research and designing departments on a rather large scale. In the process of working and constructing ships, the new force is growing rapidly.

This was evident in the last two investigation conferences, for although there were senior engineers and advisors between the ages of 60 and 80 who participated in the conference, those who presented the design figures, the estimates and other data---in other words, those who were in charge of designing---were young men in their twenties. Some of them were not engineers but technicians, and some were not graduates of universities or special institutions but middle grade technical schools.

But, under the leadership of the Party, these people have overcome superstitions, liberated their thought and become very daring in their thinking and in their deeds. With the assistance of the engineers, they have finally overcome technical difficulties through their perseverance in learning and training, through the use of collective wisdom and through their willingness to learn from others, including the workers. According to the experts at the investigation conference, these people are very careful and thorough in their designing. Although some problems still exist, they are not important ones.

The person in charge of designing the 2,000 horsepower and 3,800 horsepower marine diesel engines served as a recorder, a draftsman, etc. in an oil company. After the liberation, he entered a night school with the help of the Party. Working hard and with the help of other comrades, he was able to accomplish creatively his new technical mission. A senior engineer said: "What I thought about and talked about several decades ago, I was never able to realize. Now the young men have been able to do it under the leadership of the Party. The young men in the age of Mao Tse-tung have really surpassed us."

In the past ten years, our technical personnel have increased as much as twenty-fold. They started with almost nothing, but in the past ten years not only has the scientific and technical level been raised and the number of personnel increased, but their thinking has also undergone rapid change.

I am speaking of only those in industrial and scientific research units. The same is true in other circles. Space does not permit me to talk about them. Their achievement is great. However, we are still quite a distance from meeting the needs of the present industrial and agricultural expansion. We must still advance under the leadership of the Party and the guidance of the General Line in order to exert our utmost efforts so that science and technology may meet the needs of industrial and agricultural production.

(3)

That the science and technology of shipbuilding has developed so rapidly in the past 10 years testifies further to the necessity and importance of the absolute leadership of the Party in science and technology. Looking back on the change in scientific and technical work in the past ten years, many engineering and technical personnel make the following remarks: "The rapid scientific and technical development and the great achievements of the past ten years are the result of the correct leadership of the Party. They are the result of firm adherence to the Party's General Line of socialist construction, the removal of superstition, the emancipation of thought, the promotion of mass movements and the overcoming of the habit of relying on experts. Finally, they are the result of the Party's educational reform of the intellectuals."

What they have mentioned are facts. The lesson that the facts of the past ten years has taught them is a profound one. This is especially true of the senior and older engineering and technical personnel. They have experienced two different types of society and they can compare the two situations, which are completely different. The impression that they have formed is thus a very deep one. The change in the past ten years has given us a deep understanding of the following:

In exercising its leadership over scientific and technical work, the Party must first of all resolutely carry out its General Line of socialist construction in the scientific and technical units as well as the policy of devoting science and technology to production. In order to reach this objective, the Party must emphasize the role of political ideology in scientific and technical work. It must carry out mass campaigns emancipate thought, and promote the habit of daring to think and to act.

Owing to their former class positions and to their bourgeois

education and training, many intellectuals consider scientific and technical work to be above class and stay away from politics. They have lost touch with practical work and they have lost touch with the production activities of the working masses. Their scientific and technical work thus appears to be enshrouded in mystery and full of superstition. Their viewpoints are colored by the desire for prestige and profit. Guided by their own interest, they have formed a bourgeois line of thought among scientific and technical experts. This line thus comes into conflict with the policy of implementing the Party's General Line of socialist construction and the promotion of mass movements.

The Party has not only carried out a political struggle against the bourgeois line of science and technology, but has also undertaken the difficult task of thought reform. In the various movements in the past 10 years, especially the rectification movement, the anti-rightist movement and the great leap forward campaign, the Party has carried out a very practical and convincing educational reform among the bourgeois intellectuals.

In the practice of scientific research, the Party has led and organized them "to do research outdoors and in the factories." This has enabled them to leave the research laboratories in which they have been confined for years and to engage in the practice of production. In engaging themselves in production, they can not only select topics and research themes that are related to production and bring scientific research closer to the needs of production, but they also come to understand the interdependence and interaction between science, technology and production. Therefore, production provides not only a test for the results of scientific research. It also provides the future major topics for research. This enables the intellectuals to have contact with the working classes and at the same time to learn what they are not able to learn from books.

In science and technology, owing to the shattering of superstitions, the emancipation of thought, the mass movements and the mass line, especially the implementation of the Party's general line in scientific research work, a great leap forward has been carried out and results that were considered impossible in the past have been achieved. The achievements in scientific research in 1958 increased 10 to 20 times over those of 1957. The new practice taught the engineering and technical personnel to abandon the old road of bourgeois scientific research and establish and gradually

strengthen the new road of socialist scientific research. It has also taught them to reduce the distance that separates them from the Party and the working people. Some of the intellectuals are coming closer to the intellectuals of the working class.

The scientific and technical development of the past 10 years has enabled us to recognize the truth that all enterprises must come under the leadership of the Party and follow its General Line before they can leap forward. If they go against the Party or depart from it, they will not only fail to leap forward but will commit errors. To the engineers, it is not a question of whether we should have Party leadership in science and technology or whether the Party is able to give leadership. They feel that without the leadership of the Communist Party there will be no real scientific research and no great leap forward in science and technology.

This is the basic reason for the rapid rise in the level of science and technology, the rapid increase in the technical force and the intellectual change among scientific and technical personnel.

THE SHIPBUILDING INDUSTRY IN THE PAST TEN YEARS

[This is a translation of an article written by the editorial department of Chung-kuo Tsao-ch'uan (Chinese shipbuilding), No 4, 15 Oct. 1959, pages 5-14.]

(1)

Shipbuilding began very early in our history. Through their intelligence and hard work, our ancestors accomplished great feats in shipbuilding. According to tradition, ships were invented at the time of the Yellow Emperor, about 4,600 years ago. Further progress was made in the Ch'in and Han dynasties. By the 5th century, ocean-going sail boats were built. These won universal acclaim.

After the Opium War of 1840, China became a semi-colonial and semi-feudal country. The imperialist powers began to develop their shipping enterprise in China on a big scale with the object of taking over that sphere of activity. This was the beginning of the modern shipbuilding and ship repairing enterprise in China.

China's own shipbuilding enterprise began with the establishment of the Kiangnan Shipyard by the Manchu Government in 1865. Later, the Foochow Shipyard and the Taku Shipyard were established. At that time, we had to depend upon the imperialist powers for the principal materials for building ships and for production techniques. The production capacity was very low.

After the 1912 Revolution, the shipbuilding industry remained in a backward state under the control of the imperialists, the feudal forces and bureaucratic capitalism. Its activities were confined chiefly to the repairing of ships. The total production of these shipyards for almost a century before the liberation amounted to only 500,000 tons. The average production was less than 6,000 tons a year.

Before the liberation, our ship repair enterprise was concentrated chiefly in Shanghai and several other cities which were under the domination of the imperialists. These shipyards chiefly served the imperialist interests. In the interior, there were very few modern shipyards. River transportation depended principally on wooden sail boats. According

to the statistics of 1949 when the whole country was liberated, the tonnage of wooden sail boats constituted 94 percent of the total river shipping in the whole country.

On the eve of the liberation when the Chiang Kai-shek clique was fleeing to Taiwan, they attempted to destroy what little shipbuilding capacity there was in the country. Although their attempt was not completely successful, most of the docks, factories, machinery and other shipbuilding equipment were seriously damaged. They also took with them large amounts of money. When the liberation came, the Chinese people were left with a shipbuilding enterprise that was in ruins.

(2)

After the liberation, we immediately repaired all the damages inflicted on the shipbuilding enterprise by the Kuomintang reactionaries and resumed production rapidly. All this was done under the leadership of the Party and the People's Government and the directive of Chairman Mao "To rely on the working class in promoting production." At the same time, a democratic reform movement was carried out. The masses were mobilized to put down and liquidate the counter-revolutionary elements hidden in the enterprise and other feudal and evil elements who committed crimes and oppressed the workers. The cooperation of the old technical personnel was obtained and their reform achieved. The old guarantee system which was oppressive to the workers was abolished. Migrant workers became permanent workers. In this way, their days of wandering and the state of semi-employment were brought to an end. They became real masters of the enterprise.

The next step was wage reform. The irrational wage system left over from the old system under which the same work was compensated according to different rates of payment was abolished. A new wage system following the socialist principle of distribution of compensation according to labor was established. The remnants of the imperialist and bureaucratic capitalist ruling class were completely eradicated. Thus the shipbuilding capacity was liberated and the way paved for the development of the shipbuilding industry in the future.

In 1953, construction under the First Five-year Plan began. In order to carry out the directive of the Party and the government to "lay the preliminary foundation for shipbuilding through the First Five-Year Plan," the shipbuilding enterprise undertook to reform production in the existing enterprise and

to establish a basic process of production. An over-all technical reform was carried out from designing to production technique, production organization and management according to the technical requirements of modern shipbuilding.

This was done under the leadership of the Party and the government through the efforts of the whole body of workers, with the assistance of the Soviet Government and under the direct guidance of Soviet experts. The technical level was raised, the advanced techniques mastered and the state of technical backwardness basically altered. Basic construction on a large scale was begun. While old factories were being expanded and altered and new factories constructed, we established a ship science research institute, a ship designing institute, a shipyard designing institute, a shipbuilding institute, shipbuilding schools and shipbuilding technical schools. These provided the conditions for building ships by ourselves.

In 1958, the great leap forward in production began. Under the guidance of the General Line, the workers in the shipbuilding industry shattered superstitions, liberated their thinking, carried out a technological revolution with great vigor and promoted a mass movement. This produced a further change in the shipbuilding enterprise. With the transmission of the bulletin and resolution of the Eighth Plenary Meeting of the Eighth Party Congress, a new high tide in production was created. This high tide is now advancing wave after wave. We are now viewing a greater leap forward.

(3)

In the past ten years, the Party and the government have carried out large-scale capital construction in the shipbuilding industry. Construction work proceeded simultaneously in the building of new shipyards and the expansion and alteration of old ones. Plans for the whole plant and the designing of individual shops were carried out at the same time. Such important measures as designing, construction, capital construction and production were also carried out at the same time.

With Soviet technical assistance and under the guidance of Soviet experts, we constructed and learned at the same time. Several old plants were expanded into modern socialist large-scale plants. We have thus established a base for the construction of ocean liners and large coastal vessels.

In these enterprises, we have installed modern machinery and processing equipment and we have raised the capacity of machine processing. We have installed large cranes, and a large supply of equipment for welding. Thus the slow process of riveting is giving way to that of welding in shipbuilding. Hence conditions have thus been created for the building of ships by sections, and to utilize detachable platforms, parallel construction and other advanced techniques. In ship launching, electrically controlled vertical and horizontal slip ways have been installed. The old style platform was altered and an outdoor water level platform constructed.

In addition, new engine building units were constructed and old ones expanded so as to solve in part the problem of engine supply. Weak links in the shipbuilding industry, such as the manufacture of instruments and other special machinery and the forging of large parts have been strengthened through the construction of new plants and cooperation with related industries.

Simultaneous with the construction and expansion of large shipyards, numerous medium and small shipyards have been constructed and expanded in the principal navigation areas and fishing bases in order to increase the capacity to build medium and small river and coastal vessels. The large-scale capital construction of the past ten years has enabled us to increase the shipbuilding capacity and to lay the preliminary foundation of shipbuilding without outside assistance.

In order to raise the quality and quantity of ship production and to improve our technique, we must expand our research in the science of shipbuilding and the work of designing. Before the liberation, we did not have a shipbuilding research body. All the research and tests which are done in the process of designing and testing, such as the testing of ship models, had to be done abroad.

After the liberation, in 1950, a test pool for ship models was begun with the support of the Party and the government. All of the construction work, including the manufacture of delicate instruments for electronic control and instruments for measurement, were designed and tested by ourselves. The pool was completed and put to use in 1954. Later, to meet the requirements of the growing shipbuilding industry, water "tunnels", wind tunnels, outdoor test pools and other devices were constructed in order to carry out experiments.

The research and testing work in the fields of shipbuilding

materials, shipbuilding technology, ship structure, power installations and electrical instruments is also being developed. The results of research done in the past few years are having an important effect on advances in the production technique of shipbuilding.

In order to coordinate the trial manufacture of new products and to solve the key problems in production technique, central laboratories have been established in the principal shipyards all over the country in the past 10 years. They serve to coordinate the production and research departments and carry out experiments and research in welding, materials and forging. In addition, a teaching department coordinates teaching with production and is developing on a large scale work in theoretical research and experiments. Some teaching departments have built well equipped ship model test pools and structural mechanics laboratories.

The designing personnel engaged in shipbuilding and the capital construction of shipyards were trained after the liberation and gradually increased. When a designing group was formed in the shipbuilding enterprise in 1950, the personnel amounted to only 20 persons. This group has been expanded in the past 10 years and it now includes the independent designing bodies in the various special designing offices.

The principal large and medium shipyards have also established designing sections and offices. We translate foreign designs as well as create our own. Our designing ranges from simple river tug-boats, tenders and steam engines used on small craft to ocean liners, technically complex ships, fishing boats, and diesel and steam engines used on large ships. In the past 10 years, the designing departments have produced for the state hundreds of designs of different types of ships, dozens of designs of ship engines and thousands of designs of ship equipment. The departments have basically met the production needs. Organs engaged in design work on the capital construction of shipyards have been created. The shipyard designing institute can now undertake the task of designing all types of shipyards.

Now that we have our own research facilities for shipbuilding and the independent capacity for designing, we can use new techniques extensively. We can also design new ships to meet the requirements of the hydrological and weather conditions along the coast and the natural conditions of the harbors and bays. In this way, we can raise the technical level of our shipbuilding industry to the advanced international level.

With the construction of shipyards and the setting up of scientific research and designing bodies, the productive capacity has been augmented and the number of staff members and workers engaged in shipbuilding is being constantly increased. In the past 10 years, the Party and the government have constantly transferred cadres and recruited workers to join the ranks of those engaged in shipbuilding.

Following the policy of "letting technical personnel return to their jobs", the Party and the government have enabled the unemployed shipbuilding technicians of the old society and those who had drifted to other professions to return to the shipbuilding industry. They have been employed according to their professional skills and are now able to make full use of their abilities.

In order to meet the needs of the expanding production, new personnel are being trained. Shipbuilding institutes are also being expanded. In the old days, the Communications University and T'ung Chi University were the only universities that had shipbuilding departments. Now such departments have been established in the universities located in all the principal shipbuilding areas. Technical schools on the middle level and schools for technical workers have also been established. In addition, after work schools have been established in all the factories, and in the designing and scientific research institutes. In this way, many designing and technical personnel have been trained.

Under the leadership of the Party and the government and with the technical assistance of the Soviet Union and other socialist countries, the staff members and workers engaged in the shipbuilding enterprise are gradually mastering the advanced technique of shipbuilding through training in practical production. Their political awareness and work enthusiasm have been greatly raised through the various political campaigns, especially the rectification campaign in 1957 and the great leap forward in production in 1958. All these factors---the large working force, the establishment of new enterprises mentioned above, the reform and expansion of the old enterprises and the creation and increase of designing and scientific research bodies---are enabling the shipbuilding industry to advance rapidly.

(4)

The total production of our shipbuilding industry in the past 10 years is more than twice that achieved in the entire preceding century in old China. The First Five-Year Plan which began in 1953 was completed ahead of time in 1956. The great leap forward in 1958 and 1959 took off from the foundation laid by the First Five-Year Plan. The work of the past few years has enabled our water transportation, the aquatic product enterprises and the tonnage of modern ships to be increased by more than one-fold over the pre-liberation period.

In the production of ships, the development in the past 10 years has been from smaller to larger craft, from a small number of ships to a large number of ships and from simple craft to more complicated ones. During the initial period following liberation, the shipbuilding industry was able to construct only simple river tug-boats and tenders. We are now able to construct large and technically complex ships for all departments of the national economy and for national defense. In the past 10 years, ships of the following categories have been built: coastal freighters of 50 tons, 3,000 tons and 5,000 tons; passenger and freight vessels designed to carry 80, 200 and 500 passengers; 1000 ton and 1,800 ton freighters; passenger boats with a capacity of 400-600 and 1000 persons; 40 to 2,000 horse-power river tug-boats, and 50 ton to 2,000 ton tenders; 75 horsepower to 350 horsepower fishing boats, refrigeration boats and aquatic product investigation boats for the use of the aquatic product department; mud dredgers, sand dredgers and electric power generating ships for water conservancy work and improvement of waterways; survey ships and meteorological survey ships; shallow water ice-breakers for use during the flood period on the lower reaches of the Yellow River; river ferries for trains and automobiles; racing boats for athletic contests and other types.

In ship repairing, we have raised and repaired ships that were damaged and sunk during the Kuomintang era, such as the Chiang Yeh, Min Chu, etc., and enabled them to return to service. Also, passenger ferry boats for use on the Yangtze River are about to be completed, and the construction of 10,000 ton ocean freighters has begun. Before long, these ships, flying our national colors, will be seen in overseas ports. This will open a new era in which large ocean going vessels of our own construction will be used to cross the seas.

With the increase in the amount of shipbuilding and in the types of ships built, there have also been developments in nautical instruments and ship materials. In the early period of the liberation, we could only build medium and small steam engines, improve these engines, increase their variety and build 1,500 and 2,400 horsepower steam engines. As far as internal combustion engines for ships are concerned, we built 5 to 900 horsepower diesel engines. As to the building of heavy low-speed diesel engines, we always considered them to be beyond our capacity.

In the great leap forward in 1958, the staff members and workers of the shipbuilding industry emancipated their thought and shattered false beliefs under the guidance of the Party's General Line. They started to design and build, and with the help of related departments the designing and trial manufacture of 2,000 to 3,000 horsepower low speed diesel engines were completed in the short period of four and a half months. These two engines are now undergoing strict tests by the government. The 2,000 horsepower engine has passed the preliminary test. Its fuel consumption, power production and other technical standards have reached the advanced level. Further studies and improvements are now being made.

Steam turbines are now being used in ships of our own construction. Steam turbines of 5,000 horsepower designed and constructed by ourselves will be used in 6,000 ton ocean going freighters. More efficient ship steam turbines and free piston combustion engines have been designed and are in the stage of trial manufacture.

In ship auxiliary engines we have completed the manufacture of anchor winches, electric pumps, propellor shaft pumps, hydraulic steering engines, liquid pressure axle joints, etc. In ship instruments, we have built all types of compasses, sounding machines, range finders, radar units, instruments for detecting fish schools [sonar] etc. We are on the way toward becoming independent of foreign imports.

In the initial period following liberation, we had to depend upon foreign countries for the steel used in shipbuilding, especially the steel used in building ocean going vessels. At present, we are able not only to provide the steel for ships in general, but also to produce a high strength steel alloy of a superior quality. We have succeeded in trial manufacturing the latter. This steel alloy has been used in the construction of 10,000 ton ocean going ships of our own design.

The development in the production of different types of ships in the past ten years has been accompanied by an overall improvement in the quality and functioning of the products. In the past few years, the ships that we have built have undergone tests and are found to measure up to the standards stipulated by the government as far as the quality of construction cannot be separated from the wide promotion of new technology and the use of new techniques in the shipyards.

With the technical improvement in the enterprise, all large and medium shipyards in the country have learned to use the modern shipbuilding technique of welding. The use of semi-automatic and automatic techniques of welding has increased. In installation work, optical instruments have been used in the installation of the main engine and the axle system. All kinds of platforms and scaffolding are used to insure the quality of welding. In the work of testing, all kinds of scientific testing instruments, such as super-sonic instruments for detecting damage and X-ray and Gamma-ray instruments for testing the quality of welding, are used. Compressed air rather than water is used for testing the watertight quality of the hold. Vibration instruments are used to test the vibration of ships after they are in use. The use of these new techniques and instruments not only insures the quality of ship construction but also shortens the construction time.

The shortening of the time required for designing and construction has been quite significant in the past 10 years. In the initial period following liberation, it took five months to design a 50 ton transport and 207 days to build it. And it took four months to design a river freighter and 202 days to build it. In 1958, the Kiangnan Shipyard designed a 5,000 ton coastal freighter in only three months and built it in five months and twelve days. A 250 horsepower fishing boat was built in 300 days in 1954. In 1958, the new shipyard completed a similar ship in only 82 days. An ice-breaker for use on the Yellow River built by the Chung-hua Shipyard in 1957 took only 11 months from the designing stage to the trial run.

In ship repairing, the situation is the same. In repairing the ships Chiang-yung and Chang-chiang No. 402 in 1958, the Pai-lien-ching Shipyard in Shanghai reduced the amount of time stipulated in 1954 for such jobs by 87.7 percent.

After the publication of the bulletin and the resolution of the Eighth Plenary Session of the Eighth Party Congress, the

staff members and workers of the shipbuilding industry were further stimulated. The construction of the dry dock for the second 5,000 ton freighter took the Kiangnan Shipyard only 35 days. The construction of a dry dock to accommodate a 3,000 ton coastal freighter took the Hu-tung Shipyard only 19 days. Not only is such speed unprecedented in our country, it is seldom experienced in such capitalist countries as Great Britain and Japan, which are experienced in shipbuilding.

(5)

Like other industries, the shipbuilding industry produced a high tide in the great leap forward in production in 1958. This was accomplished because of the victory of the rectification campaign. Many items were produced which were never thought possible before. These include high powered diesel engines, inertia ferries, kuan-hsing tu-lun/plastic boats, steel mesh reinforced cement boats, light and electric remote control cutting machines, etc. In order to support the steel industry, the various shipyards produced many steel refining and pressing machines such as the 2,300 millimeter thin plate pressure machine, the 1,200 ton hydraulic machine, etc. The Chung-hua Shipyard produced a 54,000 cubic meter gas tank and other equipment.

In the past, many shipyards could only repair ships and not build them. During the period of the great leap forward, they all produced small ships. The Nanking Shipyard designed and constructed 80 horsepower tug-boats, the Wuchang Repair Yard constructed 500 horsepower tug-boats, the Foochow Shipyard constructed a 300 horsepower gas engine tug-boat, and the Chang-hua-pin Shipyard constructed a 280 horsepower fishing boat.

There were many shipyards which found it difficult in the past even to repair machines. Now they are able to build machines used on ships to meet local needs. The Hankow Shipyard, the Changsha Shipyard and the Harbin Shipyard have all built all types of medium and low power diesel engines and gas engines.

During the great leap forward in production, many shipyards were short of material, parts and equipment. However, under the stimulation of the Party's general line, the staff members and workers of the shipbuilding industry looked to themselves rather than to others for a solution to their problems. Besides thinking of ways to economize on materials in designing

and technical work, many enterprises began to develop their own resources and establish satellite plants, such as plants for timber processing, planing, cement, steel refineries and so forth so as to insure a great leap forward in production.

When these enterprises encountered such difficulties as a lack of capacity for mechanical processing and an inadequate supply of electric power, they followed the Party's policy of using both native and foreign methods to make full use of their own capabilities to solve their problems. The following are examples of this. The Pai-lien-ching Shipyard made use of scrap steel plates to make compressed corrugated furnaces.

The Wuhu Shipyard improvised double shaft lathes to meet the demand for that type of machine. The Wuchang Shipyard and the Hu-tung Shipyard have succeeded in their experiments to refine steel through the use of pressure injection of pure oxygen. The Foochow Shipyard built an automatic electric welding machine. The Dairen Shipyard built its own power plant, consisting of a 1,500 kilowatt steam turbine. And, old iron plates were used in place of steel to build a 400 to 900 kilowatt generator; and thermal power plant of over 10,000 kilowatts was built to solve the problem of power supply.

During this period, the masses organized many forms of contests and gatherings "to compare with the advanced, learn from the advanced and catch up with the advanced, such as "hero competition", "contests on the stage", "planting the Red Flag", "Chu-ko-liang Parties", "garden parties", "night markets", etc. They also organized shock teams, leap forward teams and contests between co-workers, factories, shops, small groups and individuals. These contests produced great excitement and enthusiasm.

Large scale mass campaigns are campaigns for carrying out communist education among the staff members and workers. With their communist behavior and awareness greatly improved, they exhibited everywhere the attitude of daring to think and daring to act, and of indifference to compensation, working hours and conditions. They told the Party that "all they wanted was the Red Flag and communism and not money." They expressed the determination "not to leave the boat until the boat leaves the yard." When the contest between the various shipyards began, they all exhibited the communist spirit of satisfying others before satisfying themselves and of encouraging and helping each other in order that they might leap forward together. For instance, when a contest took place between the Kiangnan Shipyard and the Dairen Shipyard in building 5,000 ton freighters, the two shipyards were contestants as well as co-workers.

Their ships were completed at the same time and they met in celebration of their victory at Woosung.

In sum, the great leap forward in production in 1958 enabled our shipbuilding industry to reap a double harvest--- in production as well as in political ideology. At the same time, the industry has gained rich experiences which will provide the basis for a greater leap forward in 1959. This is only the beginning of the future great leap forward in the shipbuilding industry. As in the case of lowers that are starting to blossom in the spring, we can expect to see a full bloom in the near future.

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In the past ten years, the staff members and workers of the shipbuilding industry have struggled hard and achieved a great deal under the correct leadership of the Party and the government and with the assistance of the Soviet Union and other socialist countries. However, this is only the first step in our long journey. We have not yet completely established an independent shipbuilding system. We are not yet able to supply all the materials, ship equipment and instruments. Our production technique has not yet caught up completely with the world level. Whether considered in terms of quantity, variety or quality, our products are far from adequate to meet the requirements of the various departments of the national economy and national defense. We must make greater exertions to develop our shipbuilding industry at a greater speed so as to meet the needs.

We are a country endowed with natural conditions for water transportation. We have a coastline of over 12,000 kilometers, with many good harbors along it, as well as many islands. The rivers have a total length of 410,000 kilometers and they are widely distributed. Moreover, since we are situated in the temperate zone, most of the harbors and rivers are ice free all year round and open to navigation in all seasons. In the future, when the plan for a national water network is completed, the amount of river navigation will be increased many fold. The water transportation situation will be radically changed, and the need for transport ships will be greatly increased.

We have 430,000 square miles of salt-water fishing ground over the shallow sea above the continental shelf (the depth is between 50 and 200 meters). There is an area of 100,000,000

mouth over the rivers and lakes that may be used for raising fish and shrimp. Aquatic resources are thus very rich. With the rapid development of the aquatic products industry, there will be a greater demand for modern fishing boats, whalers, refrigeration ships, aquatic product investigation ships, fish processing ships and other types. Large scale water conservancy projects, waterway improvements, construction of hydro-electric stations, oceanographic studies, etc., will also require a large number of ships for technical purposes. With the development of agriculture, more irrigation boats will be needed. Moreover, the technical improvement of over 3,000,000 tons of sail powered wooden transports and 140,000 sail fishing boats will also be a difficult task.

At present, imperialism still exists. The Chiang Kai-shek reactionary clique still occupies our territory of Taiwan and are still putting up a desperate struggle. In order to liberate our territory of Taiwan, to protect our socialist construction, to defend world peace and to guard against the intrigues of the imperialist and reactionary factions, we must have a strong modern navy to strengthen our national defense.

It is obvious that the task of the staff members and workers of our shipbuilding industry to satisfy the needs of various departments is as glorious as well as a difficult one.

Hereafter, the shipbuilding industry will follow the socialist principle of planned and proportional development and the Party policy of "walking on both legs". It will do so under the guidance of the Party's General Line for building socialism. The construction of large, medium and small ships must proceed simultaneously. On the one hand, we must achieve a technological break-through in constructing large ships, large engines and modern warships to meet the needs for ocean navigation and national defense. On the other hand, we must produce more and better medium and small ships, improve their technical and economic functions, promote the mechanization of wooden sail boats for fishing, and use tugboats in combination with barges for transportation purposes so as to change the outlook of our water transportation and fishing enterprise.

The shipbuilding industry must be planned on a national scale. Complete shipbuilding centers must be established according to the distribution of waterways and fishing areas. As the shipbuilding industry is a comprehensive industry, its development depends upon development of the metallurgical

industry as well as developments in instrument making and the mechanical, electrical, radio, fuel, forestry, chemical, and textile industries among others. Arrangements will be made in all these industrial departments to aid the development of the shipbuilding industry.

Concerning the supply of steel for shipbuilding, new products of various types will be constantly increased. Both in variety and quantity, the production is expected to satisfy the needs of the shipbuilding industry in the country in a short period of time. As to ship engines, the existing capacity will be fully developed and ship engine plants will be constructed in coordination with the development of the shipbuilding industry.

As to electric motors used on ships and in navigation instruments, new plants will be established, the output of new products will be increased and the manufacturing capacity will be raised. This will provide the equipment required to utilize automatic means of navigation. The production of various ship auxiliary engines will also be energetically developed. In addition, arrangements will be made to supply health equipment, articles used on ships, small metal parts, ship furniture, kitchen and bed-room equipment, life saving equipment, sail-rope, varnish, plastics, insulators, etc., to meet the needs and to coordinate with the over-all development of the shipbuilding industry.

The shipbuilding industry will hereafter be supplied with the most modern technical equipment. The production process will be mechanised, and electric and automatic equipment will be used. Modern ships of the best quality will be designed and built. The designing of machines and instruments used on ships will be promoted and scientific research and manufacturing techniques will be developed. The technical and economic capacity of ships will be raised. The shipbuilding industry must unify the ship models, serialize ship machines and standardize ship equipment on the basis of advanced technique. It must strive to carry out more efficiently the Party's General Line "to build socialism by exerting our utmost efforts and pressing ahead consistently to achieve greater, faster, better and more economical results."

In scientific research, we shall hereafter establish a complete shipbuilding scientific research organ which will include liquid mechanics, structural mechanics, experimental power stations, shipbuilding technology, ship materials, electrical instruments used on ships and other items. Designing bodies will be set up according to plan for the designing

of all types of ships, machines used on ships and ship equipment etc. This will be organized step by step on the present foundation.

As to the training of shipbuilding personnel, besides strengthening the thought reform and the training of the technical personnel in their profession, we must establish shipbuilding departments and middle technical schools in the principal shipbuilding areas so as to produce an adequate supply of "red and expert" personnel for the development of the shipbuilding industry.

The task before the shipbuilding industry is a very glorious and difficult one. We are confident that with the strong and correct leadership of the Party and higher authorities, with the assistance and cooperation of the whole people and related industries, with the selfless support of the Soviet Union and other socialist countries and with the energy and enthusiasm of the staff members and workers of the shipbuilding industry, our shipbuilding industry will accomplish the glorious task entrusted to it by the Party and the people.

Editor's note: The material contained in this article was obtained from the units concerned and does not represent statistical data formally published by the State. The publisher is responsible for any errors.

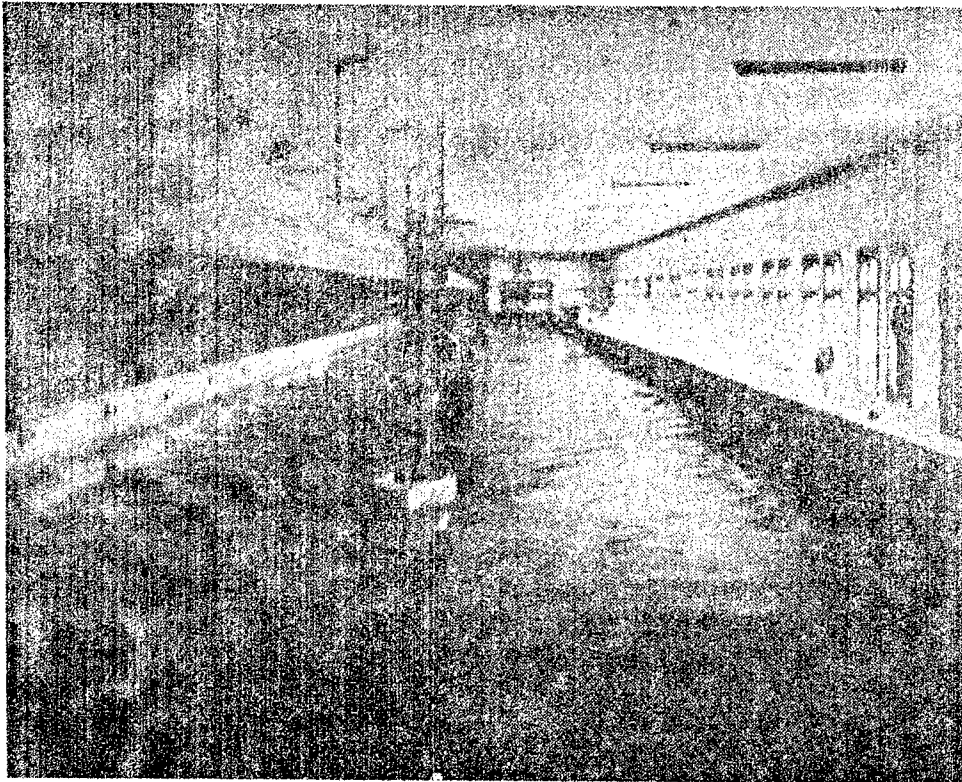


Photo 1. Ship Model Test Pools of Chinese Construction

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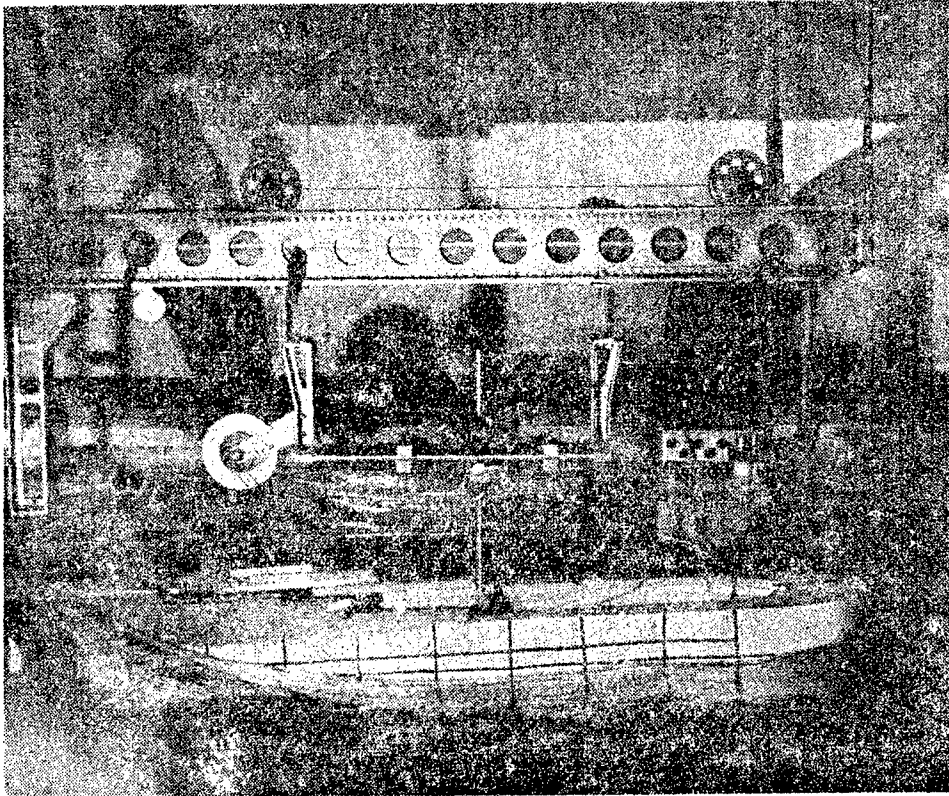


Photo 2. Ship Model Navigation Test

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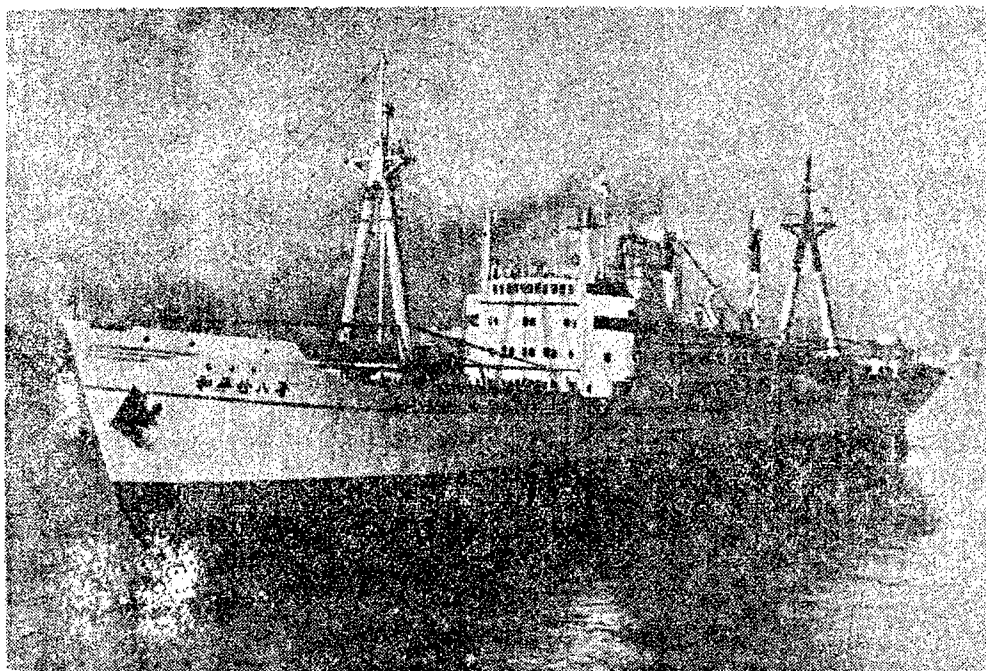
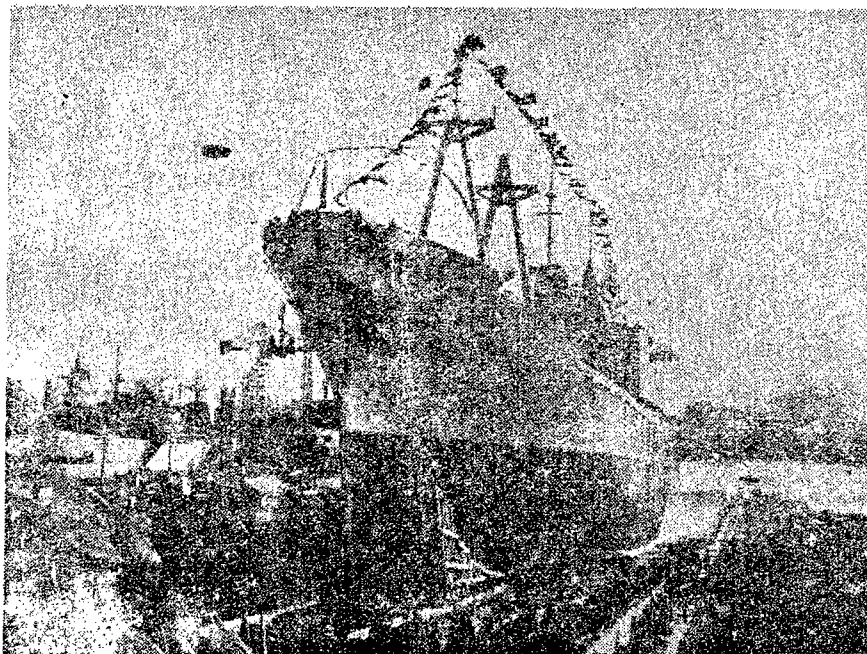


Photo 3. A 5,000-Ton Coastal Freighter

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Photo 4. "Leap Forward", A 13,400-Ton Ocean Freighter

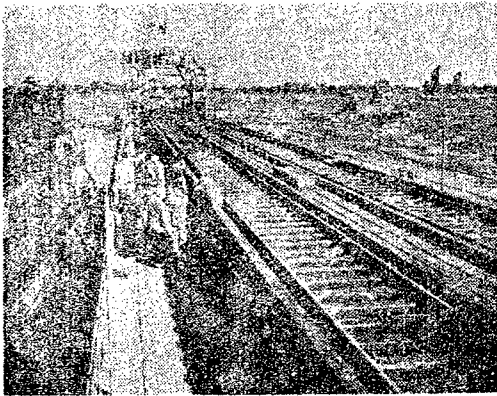


Photo 5. "Shanghai", A Railway
Car Ferry

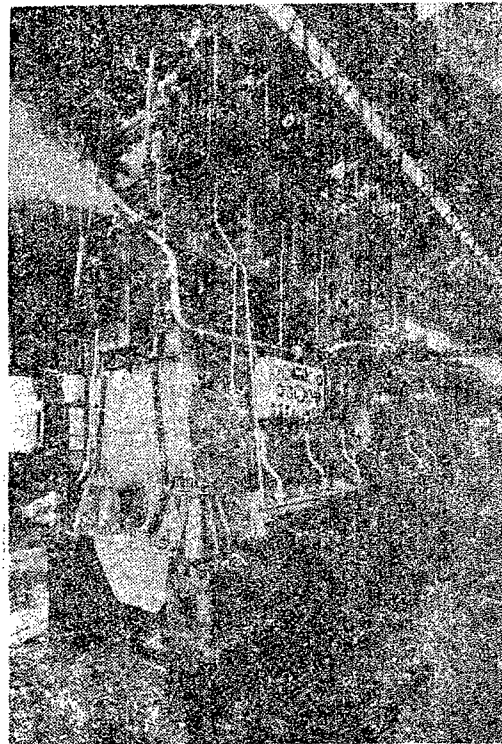


Photo 7. A 2000-Horsepower Heavy
Low-Speed Diesel Engine
of Chinese Construction

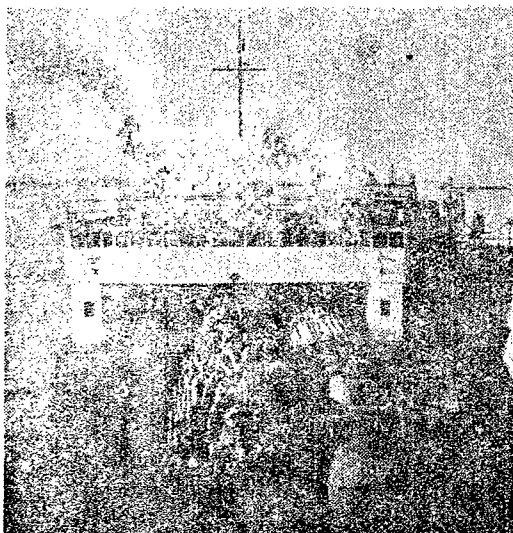


Photo 6. The Railway Car Ferry
"Shanghai" in Action

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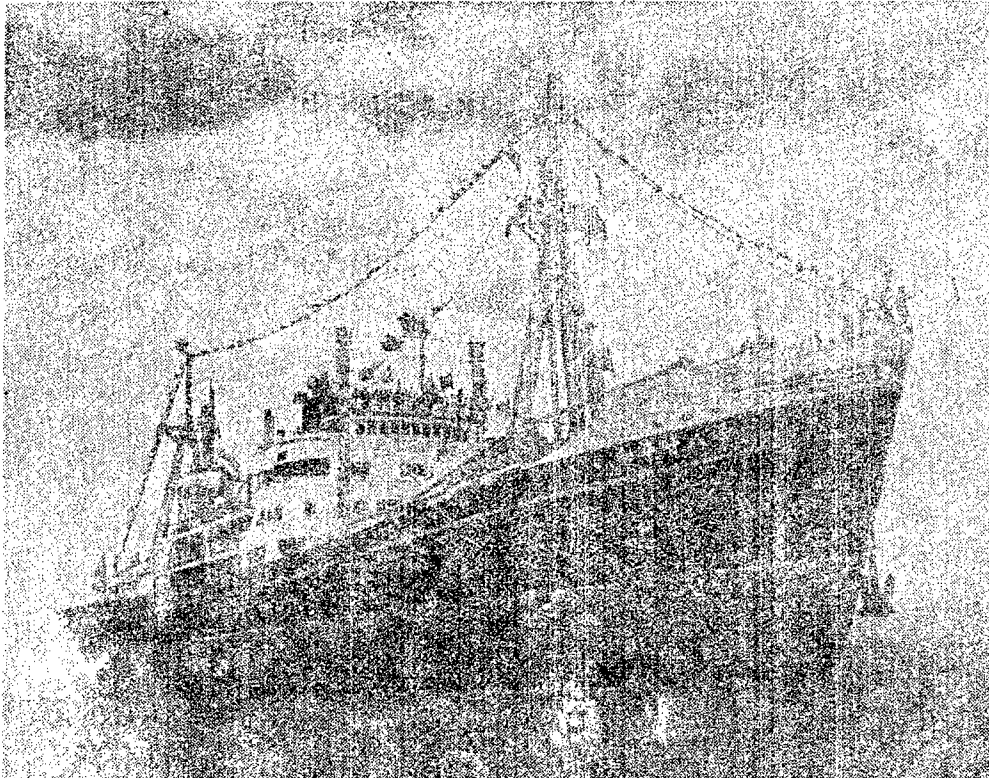


Photo 1. "Ho Ping 28" Meeting "Ho Ping 25" at Woosung

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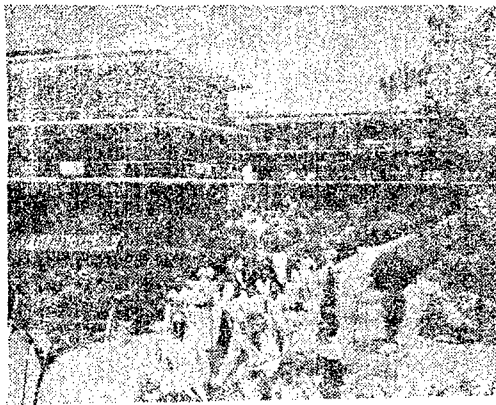


Photo 9. Infirmary at the Dairen Shipyard

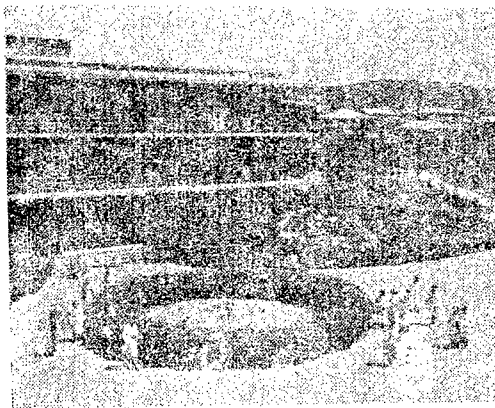


Photo 10. Workers in the Infirmary

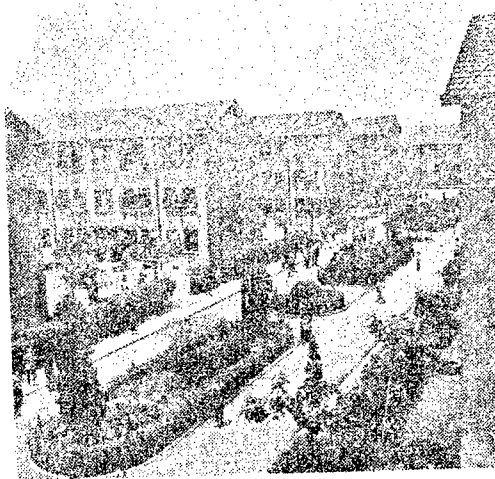


Photo 11. Dormitories for Staff Members and
Workers of the Kiangnan Shipyard

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DEVELOPMENT OF DESIGNING WORK IN SHIPYARD CAPITAL CONSTRUCTION

[This is a translation of an article written by Liu Ying-hu appearing in Chung-kuo Tsao-ch'uan (Chinese shipbuilding), No 4, 15 Oct 1959, pages 15-17.]

Synopsis

This is a brief account of the work done [in the field] of shipyard designing since the liberation. The development of this comprehensive technological science in our country is described on the basis of the special characteristics of shipyard designing.

Before the liberation, not a single shipyard was built based on designing. Moreover, there was no shipyard designing to speak of. At that time, we were completely ignorant of this field. After the liberation, we learned from the Soviet experience obtained during more than 20 years of designing. With the help of Soviet experts, we began our shipyard designing work.

The whole complicated designing process (in the wide sense, it includes pre-designing work, construction work, installation work, tests, etc.) must be carried out systematically and according to principles so that the designing of each new shipyard or the alteration and expansion of an old shipyard will meet the requirements of advanced technology as well as the economic and political requirements. In this way, all kinds of irrational and wasteful phenomena that may appear during the construction or after production has begun may be avoided. Designing work has obviously become a comprehensive technological science. It has been mastered and used by our designing personnel in designing new plants and altering old ones for our socialist construction.

We have learned from practical experience that if designing work is not carried out according to some plan, principle or system, there will be a lack of coordination between various parts of a design and between individual designs. This lack of coordination is often discovered only when the last stage of designing is reached. Sometimes, the errors are very serious and these are discovered only after construction or installation has begun. This will cause a good deal of waste

and delay in the designing and construction. Experience shows that when errors are discovered at the construction or installation stage, they are often accepted as accomplished facts. The irrational features of the construction thus persist. Superior results can be obtained only through strict designing work.

Designing units sometimes take part in drafting the overall project. As the project provides for the scale of the plant, and other important matters relating to the process of construction and investments, the drafting of a project is a very delicate and complicated work. A careful study must be made of the long-term development of the plant. This is because, in building a shipyard, the heaviest investment lies in the under water structure. Once this is completed, it will last for a long period of time (several decades or even a century). These long-term plans must, therefore, be carefully considered and provided for in the planning paper.

With an increase in productive capacity, coordination and specialization in production are equally important. In completing its own work, a shipyard must depend upon the cooperation of a hundred related enterprises. Thus cooperation with other enterprises must be fully considered. Such cooperation can reduce the amount of investment, simplify administrative work, increase specialization and thus improve the quality of production. Of course, in considering the problems of cooperation in production, it is necessary to engage in comparative studies before these problems can be clarified in the task paper.

One of the first problems that must be solved in shipyard designing is that of location. That includes the selection of the general geographical area and the site of the shipyard. The former is determined by the higher authorities while the latter is determined by the designing unit.

In site selection, the designing unit should proceed according to the specifications of the approved project. If these specifications are not given in the project, the unit should make an estimate of the technical and economic specifications on the basis of the available data to serve as reference for site selection. The principal specifications are the number of principal production units (or shops), the number of staff members and workers, the plan of the shipyard, its area, the length of the shoreline, the annual transportation rate, available water and electric power, and the amount of principal materials and fuel required. These specifications

have to be taken into consideration in selecting the location of the shipyard. They also form the basis of various agreements that are to be signed.

From the time a designing unit accepts the task of site selection, it starts to consider various aspects of the designing work. These are embodied in the technical and economic specifications and involved in site selection. Experience in designing work shows that most of the problems of designing are determined and solved in the process of site selection. The selection directly affects the quality of designing, the progress of construction and the size of the investment.

Site selection involves broad technical requirements. The personnel taking part in the selection must have certain production and designing experience. Moreover, the work involves such factors as topography, meteorology, hydrology, geology and communications and transportation. Thus it is necessary to organize a group of technical personnel employed in various special lines (referring to the special lines in the designing unit) to carry out the work. If the group is short of a certain type of special personnel, the accomplishment of this technically complex task which requires concrete study and analysis may be affected.

In general, several possible locations (at least three or four) are chosen. The data obtained through investigation and survey are then analysed and compared so that a location that fulfills the requirements can be selected. In this work, the shore line, water conditions, the area and configuration of the site, and the hydrological and the geological conditions are the principal factors to be analysed and compared.

In altering old shipyards, the designing unit must know the conditions of the original shipyard so that the existing equipment and buildings may be fully and rationally used. At the beginning of the designing work, the designing unit must carry out a full investigation of the shipyard so as to provide a basis for its work. The investigation must be carefully done for the result may directly affect the quality of the designing.

The basic data of designing provides the principal basis for the designing of a shipyard. This data directly affects the construction and future production. Decisions in designing are based on this data. Basic designing cannot proceed without geological data, and the problem of launching ships cannot be considered without hydrological data.

Under the reactionary regime, no attention was paid to scientific records and the accumulation of data. Thus many categories of data are incomplete and in some cases they are full of errors. Even several years after the liberation, some data had not yet been assembled. Thus the designing personnel must be particularly careful in the work of investigation and in collecting, organizing and verifying the basic data.

As it is not possible to obtain a systematic set of data, we must look for it in the most fragmentary sources. Sometimes it is necessary to make inquiries among the older inhabitants of the locality and verify the findings on the spot. This is particularly important in investigating the water level in different localities.

In The Provisional Measures for Designing and Budgeting in Industries and Civil Construction published by the National Construction Commission, there is a special chapter which describes the basic data for designing and states what this data should contain. In designing shipyards in the past, a complete set of basic data for designing new shipyards was compiled in 12 volumes. They contain about a million characters with a great number of drawings and charts. It took many man-hours to complete the work. The content may be divided into several categories: (1) the natural conditions of the area; (2) technical and economic conditions; (3) construction conditions; and (4) various agreements. Detailed hydrological data is required for the designing of shipyards. Included would be observational and survey records on the force of waves, water temperature, chemical analysis of the water and the analysis of water insects.

In addition, the designing unit must have the designs of all the principal products stated in the production project of the shipyard and the technical data concerning their manufacturing, installation and testing.

Designing is a collective and creative work. It requires system and order so that its various parts may proceed smoothly. Any decision in designing must be considered in relation to technique, construction, motive power, health aspects, transportation and the budget. When the departments concerned with these problems have reached a decision, the work of designing proceeds according to a definite procedure. If the decisions of the various departments were not agreed upon beforehand and coordinated and if designing proceeds without a definite procedure, the design would have to be changed repeatedly and the

situation would be chaotic. The quality of the designing would be inferior and time would be wasted. The designing unit must master the whole process of designing. That is to say it must master the "Regulations Governing the Various Stages of Designing".

According to these regulations, the designing unit must be familiar with the method of drawing up a table providing for the division of labor among the production units (or shops) of a factory. This will make clear the total amount of materials required, the tasks of the various shops and the production routing of various parts. The chart showing the division of labor among the shops provides the data for the various technical divisions when they are engaged in designing their shops.

According to the "Regulations", a work progress chart for surveying and designing must be drawn up for each stage of designing (preliminary designing, technical designing and construction). The progress chart lists the following for each shop: the dates when the various departments are to submit their data and projects; carry out investigations; and the dates when the projects are to be printed, bound and distributed. In this way, the complicated procedure of designing is organized and the quality of designing will to a large extent be guaranteed.

According to the "Regulations", the task data submitted by the various departments must be submitted in a definite form. This is very helpful in guaranteeing the quality of the data submitted and in maintaining a strict procedure of designing.

In our country, the construction of a plant involves a series of technical and economic decisions stipulated by the state. In designing, each one of the stipulations must be followed. For instance, the electric power department of the state issues rules and measures concerning the supply of electric power, the transmission of electricity, etc. The health department issues various health regulations. The construction commission issues regulations on budgeting. There are also detailed regulations concerning labor protection and technical safety.

If no rules, regulations or measures were issued by the higher authorities, it would not be possible for the special divisions (technology, construction, health technique, power, economic, transportation, etc.) of the designing unit to proceed with their work. The result would be constant controversy. However, we also want our designing personnel to carry out the

regulations creatively; to carry them out by combining political, economic and technical considerations.

Through the experience of the great leap forward in 1958, the shipyard designing unit made many decisions in designing which met the requirements of quantity, speed, quality and economy. Many of the decisions were the result of the creative application of various regulations. Sometimes, however, a mechanical application of the regulations would result in wasteful decisions. This shows that when the designing personnel have gained more experience and when they have made further studies in designing, they will have the responsibility to suggest to the higher authorities revisions and supplements to the existing regulations. A correct revision of certain regulations may result in large economies in capital investment.

We can see very clearly from the above the importance and complexity of designing work. The quality of designing affects the economy of a plant in its production and bears a direct relationship to the development of the national economy. Thus each designing unit must have an economic and budget department taking charge of economic work in designing.

The principal requirement of the state is that a designing unit must make up an economic budget. Whether the amount of capital investment is correct or economical depends upon the budget. The primary task of the budget maker is to find out how to lower the cost of construction and to strictly observe the system of economy. It is, of course, necessary to have the cooperation of the designing personnel of the various special enterprises.

Next comes the economic portion of the designing. This represents the final result of the whole work. It is decisive in deciding whether the designing is technically and economically rational and whether it will be effective.

Economics personnel are becoming more familiar with the work of economic analysis. Whenever the situation provides cases for comparison, they are able to discuss and prove the economic rationality of a decision in designing. In studying the construction of large launching structures, they carried out an economic analysis by comparing different projects. In short, the importance of this economic work in designing has been recognized by the designing personnel. It is manifested in the close cooperation and coordination which exists between the designing personnel of the enterprises and the economic personnel. In this way, the completion of the task of economic analysis in designing may be guaranteed.

With rapid developments in science and technology, the designing personnel must constantly study advanced technical methods and use them in designing. This has become an important task for those engaged in designing. The field in which new techniques are used in designing is very wide. In some cases, advanced techniques are used. In others, improvements are introduced. In still others, economies in investment are effected.

Since the start of the great leap forward in 1958, the designing personnel have destroyed false beliefs, emancipated their thought and introduced innumerable improvements in designing; especially in combining native and foreign methods. Many creative designs have been introduced in technology, civil construction and public utilities. As far as technique is concerned, the designer's source of ideas has broadened. He appeals to the creativity of the workers and uses the wisdom of the masses in his work. Speaking of economic efficiency, we now can see a great deal of economy in capital construction investment and a speedup in the progress of construction.

Besides making use of the achievements in science and technology, the designing units have their own topics of research. The object is to solve certain urgent problems in designing. Sometimes a designing unit may have to do statistical work in order to collect data. When a designing unit encounters a difficult topic, it may require the cooperation of other departments. For instance, in studying projects on the construction of sea walls for shipyards along the sea coast, it is necessary to have the cooperation of the hydrological work department.

This is a brief review of several important aspects of our shipyard designing work. It is hoped that this article will give the reader an idea of the speed in the growth of shipyard designing work since the liberation ten years ago.

- END -

FOR REASONS OF SPEED AND ECONOMY
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